tinue to grow each year a few hundred plants of each of these types in trial rows on soil that is 'sick,' *i.e.*, thoroughly infested with the cabbage Fusarium. From these plants further selections are made with the aim of maintaining the best standards both as to type and disease resistance. Of course, there is opportunity for minor gains in this way, but our experience has not indicated that much improvement is to be expected in this direction. The surplus seed thus obtained is placed in the hands of the local cabbage growers' committee for commercial increase in such manner as will best maintain general standards of excellence."

REVIEW OF KLEBAHN ON LIFE HISTORIES OF ASCOMYCETES

Haupt-und Nebenfruchtformen der Askomyzeten. Eine Darstellung eigener und der in der Literatur niedergelegten Beobachtungen über die Zusammenhänge zwischen Schlauchfruchten und Konidienfruchtformen, von Heinrich Klebahn. Erster Teil Eigene Untersuchungen, Leipsig, Verlag von Gebrüder Borntraeger, 8, 1918, pp. 395. text figs. 275.

This is one of the papers prepared for the memorial volume to Dr. Ernst Stahl in celebration of his seventieth birthday. The author is already well known for his investigations of the life histories of ascomycetes as well as rusts.

As an introduction, previous work on this subject from the Tulasne Brothers and Fuckel down is briefly reviewed. The life histories of the fungi covered in this part of the work, including about 40 species and varieties, mostly pyrenomycetes, have been determined or verified by the author. The second part, which is promised later, is to cover similar work of other investigators on this subject. This work will be of great value to all mycologists and pathologists, as the various papers which have been published on life history studies are much scattered and frequently inaccessible to students and sometimes to investigators. Most of the life histories reported are based upon pure cultures from ascospores. In many cases inoculation experiments were also made. The genus *Mycosphaerella* is taken up first and the life histories of 7 species, occurring on various hosts, are described. In some of the species *Septoria* was found to be the pycnidial stage; in others the form produced was *Phleospora*. The author suggests

that the form genera *Septoria* and *Phleospora,* though separate, are very closely related, and hence keeps their ascogenous forms together. In certain other species of *Mycosphaerella,* as *M. punctiformis, M. Fragariae* and *M. maculiformis, Ramularia* is shown to be the conidial form; while in other species, as *M. cerasella,* a *Cercospora* is produced. The author concludes, therefore, that in spite of the morphological similarity of the ascogenous forms of the various species of *Mycosphaerella* they are no more closely related than their corresponding lower spore forms. *Cercospora* is said by the author to be closely related to *Ramularia,* but is considered distinct in lacking chains of conidia and in the color of the mycelium when young. In culture *Cercospora* is said to be strikingly different from *Ramularia.* On account of these differences in the lower forms found in the species of *Mycosphaerella* studied, three new generic names are proposed: *Septorisphaerella, Ramularisphaerella* and *Cercosphaerella.*

This is an innovation in nomenclature which needs serious consideration. The purpose of these compound names is evidently to suggest at once the life history of the fungus by combining the names of the perfect and imperfect stages. In the first place this plan seems to set aside all claims of priority for previous generic names and apparently proposes the substitution of entirely new names for genera as fast as their life histories are known. This alone is a radical departure from established usage. It would also lead to frequent violation of the rule against sesquipedalian names. To be consistent in the application of this method it would be necessary to combine the names of the various form genera in cases where 3 or 4 spore stages or form genera are known to belong to the life history of a single organism. The combination of so many different generic names in one would evidently be impracticable. Supposing, however, that the plan were feasible; in the present state of uncertainty as to the types of genera and the application of generic names such combinations would be uncertain in their significance and would not mean the same thing to different mycologists. The reviewer is forced to conclude, therefore, that however laudable the author's purpose in adopting these new names, there is much more to be said against the plan than for it.

Another fact might well be considered in this connection. The author recognizes that there are species of *Mycosphaerella* which have been found to have *Ascochyta* or *Diplodina* and *Cylindrosporium* as lower spore forms, and he also finds *Phyllosticta* pycnidia present in species of his *Septorisphaerella* and *Ramularisphaerella*. The experience of the reviewer has shown that in *Glomerella, Melanops* and other ascomycetes the same species will sometimes produce one form of conidial or pycnidial fructification and at other times another form, and occasionally two or three forms in succession in a single culture. It appears, therefore, that, in pure cultures from single ascospores, there is at present no certainty of securing all the spore forms belonging to the life history of the organism in a single culture, or in a few cultures. Sometimes no lower spore form is obtained, as the author indicates in some of his species, and he concludes as a result that the species possesses no such form. He cites in support of this conclusion the fact that in closely related rusts certain spore forms are lacking, whereas in others they are present. Evidence of this sort is entirely untrustworthy in the reviewer's opinion. It seems much more reasonable to expect that, if at one time we obtain a *Ramularia* or *Cercospora* and at another time, from the same or a very similar species, obtain a *Septoria* or *Phleospora,* both the conidial and pycnidial form may belong to both species; but for some unknown reason have not both developed in either case. Potebnia, a former worker in Klebahn's laboratory, also expresses this view in discussing *Mycosphaerella cerasella,* in which only a *Cercospora* type was produced. He says that by analogy we must assume the existence of the *Phleospora-Septoria* type in this species also. The reviewer has demonstrated (in MSS.) that such cases occur in *Melanops,* where in one series of cultures from ascospores only a *Dothiorella* is produced and in another series from the same species, so far as can be determined by morphological characters, and from the same host, only a *Sphaeropsis* or *Diplodia* spore form is produced.

It is a notorious fact that ascocarps are rarely produced in culture when the conidiospores or pycnospores are used as a starting point; but one would scarcely feel justified in concluding from

this that all of the forms behaving in this way are autonomous and have no ascospore stage. Until we know vastly more about the factors which determine the sequence and development of the various spore forms, it is futile to predict that, when cultures from ascospores produce ascocarps directly, the species lack lower forms; or that, when they produce pycnidia or conidia, this is the only lower spore form they possess.

The author very aptly remarks that there are many unknown factors yet to be determined in regard to the behavior of these organisms under cultural conditions.

The life histories of various species of *Gnomonia* follow, the author including under this genus what have been called *Ophiognomonia, Gnomoniella, Linospora* and *Hypospila.* The conidial forms of most of these species are referred to the form genera *Gloeosporium, Marssonina, Asteroma* and *Leptothyrium.* The only conclusion he is able to draw from the great variety of lower spore forms obtained is that, if the various intermediate states which occur between conidial and pycnidial fructifications are recognized, it may be said that the lower forms of *Gnomonia* all belong to the Melanconiaceae.

It seems evident that much more study and comparison of the morphological characters and the correlation of further life history studies are needed in order to determine the generic and specific relationships of the species and genera discussed.

In conclusion the author discusses and illustrates the life histories of several discomycetes, including *Entomopeziza Soraueri, Pseudopeziza ribis, P. Populi-albae* and *P. salicis.* As a result he concludes that species of *Gloeosporium, Marssonina* and *Entomosporium* are conidial conditions of these fungi, and that also species of *Gloeosporium, Marssonina* and similar fungi belong to species of *Gnomonia.* He, therefore, is of the opinion that the relation between these discomycetes and the pyrenomycetes mentioned is very close.

The reviewer believes, however, that this relation is not nearly so close as suggested, and that the author's conclusion is perhaps due to a misinterpretation of the form genera mentioned. *Gloeosporium,* for example, as used by Saccardo and others, includes a

most heterogeneous group of spore forms having only the most superficial and general characters in common, and the large number of so-called species when carefully studied morphologically and in culture are found to consist of very different organisms which should be placed in very different genera on the basis of a thorough knowledge of their morphological characters alone.

The author expresses the belief, however, that an improvement of the present taxonomy of the imperfect fungi can only be expected when their connection with their perfect stages is known. The phytopathological importance of such knowledge is also indicated, as the ascogenous form found on dead plant parts, and hence usually regarded as a saprophyte, may carry the parasite over winter and be the source of new and unsuspected infections in the spring.

As to which was the primitive spore form, he says: "Little is known as to whether the original form of fructification was ascogenous or conidial." Brefeld's views regarding the relation of asci to sporangia he does not consider tenable in the light of our present knowledge. The evidence thus far accumulated by the author and others would seem to justify the belief that further studies of the life histories of the ascomycetes and of the morphological and cultural characters of the various spore forms or stages will furnish most important clues to the taxonomy and phylogeny of this great group of fungi and make it possible to present a more natural system of classification than we have at present.

The numerous clear text figures given are indispensable in interpreting the work and getting exact ideas of the forms discussed. The text is less involved and more easily read than that of many German scientific writers. It is to be hoped that the author will continue these valuable studies and that the second part of the work may soon appear.

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